



KubeCon



CloudNativeCon

North America 2023



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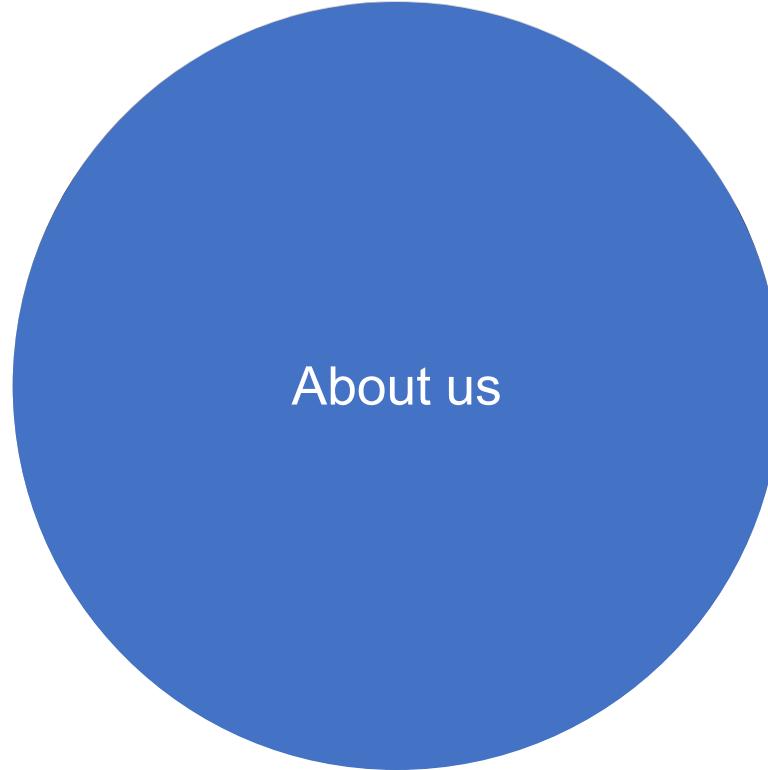
North America 2023

# Cloud Native Essentials - A 101 Tutorial to Start Your Cloud Native Journey

*Rey Lejano, SUSE*

*Eamon Bauman, Red Hat*

# About Us



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Rey Lejano  
SUSE



@reylejano

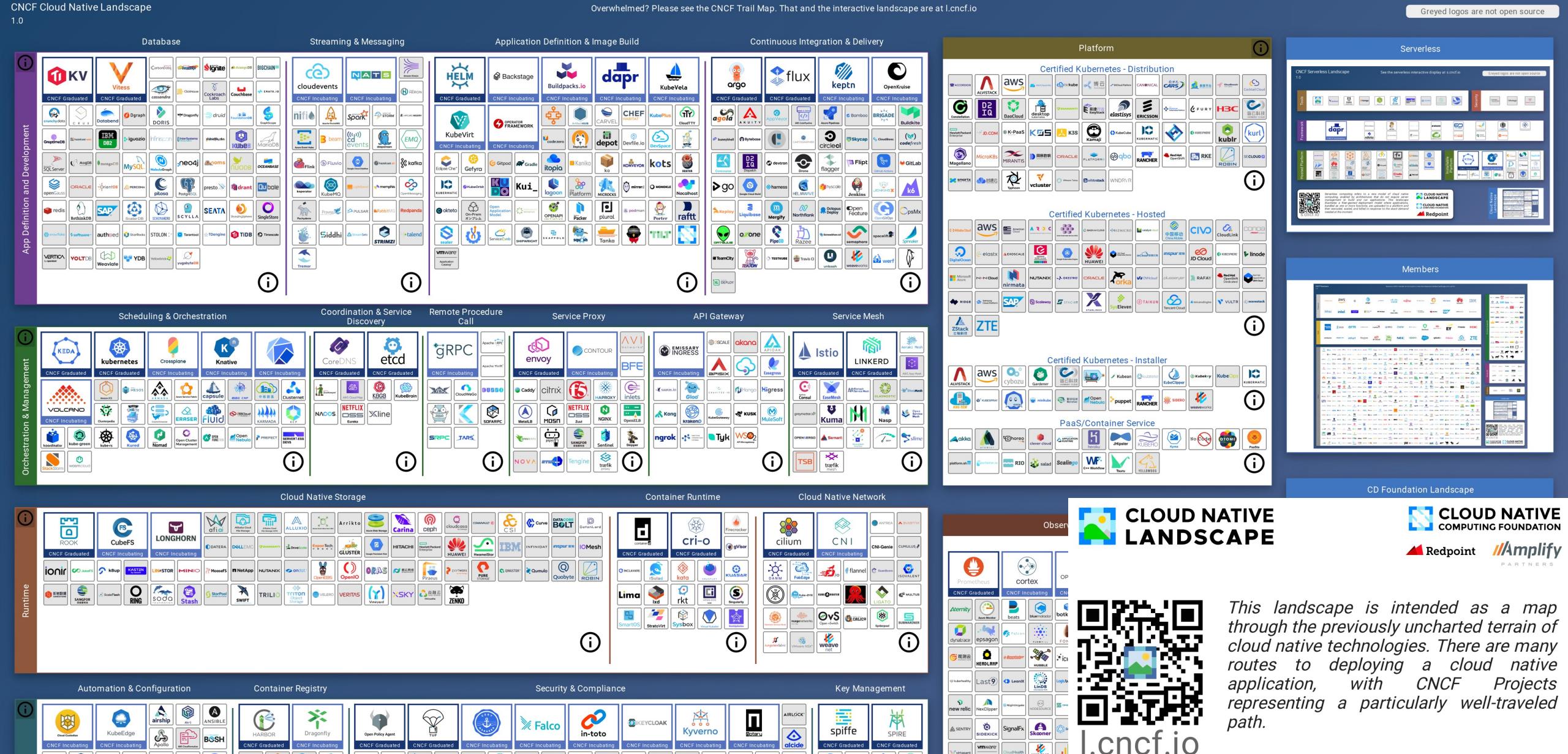


Eamon Bauman  
Red Hat



@eamonb

# Where do we start?



# Where do we start?



[l.cncf.io](https://l.cncf.io)

*This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.*

# Where do we start?



CLOUD NATIVE LANDSCAPE

CLOUD NATIVE COMPUTING FOUNDATION  
Redpoint Amplify PARTNERS

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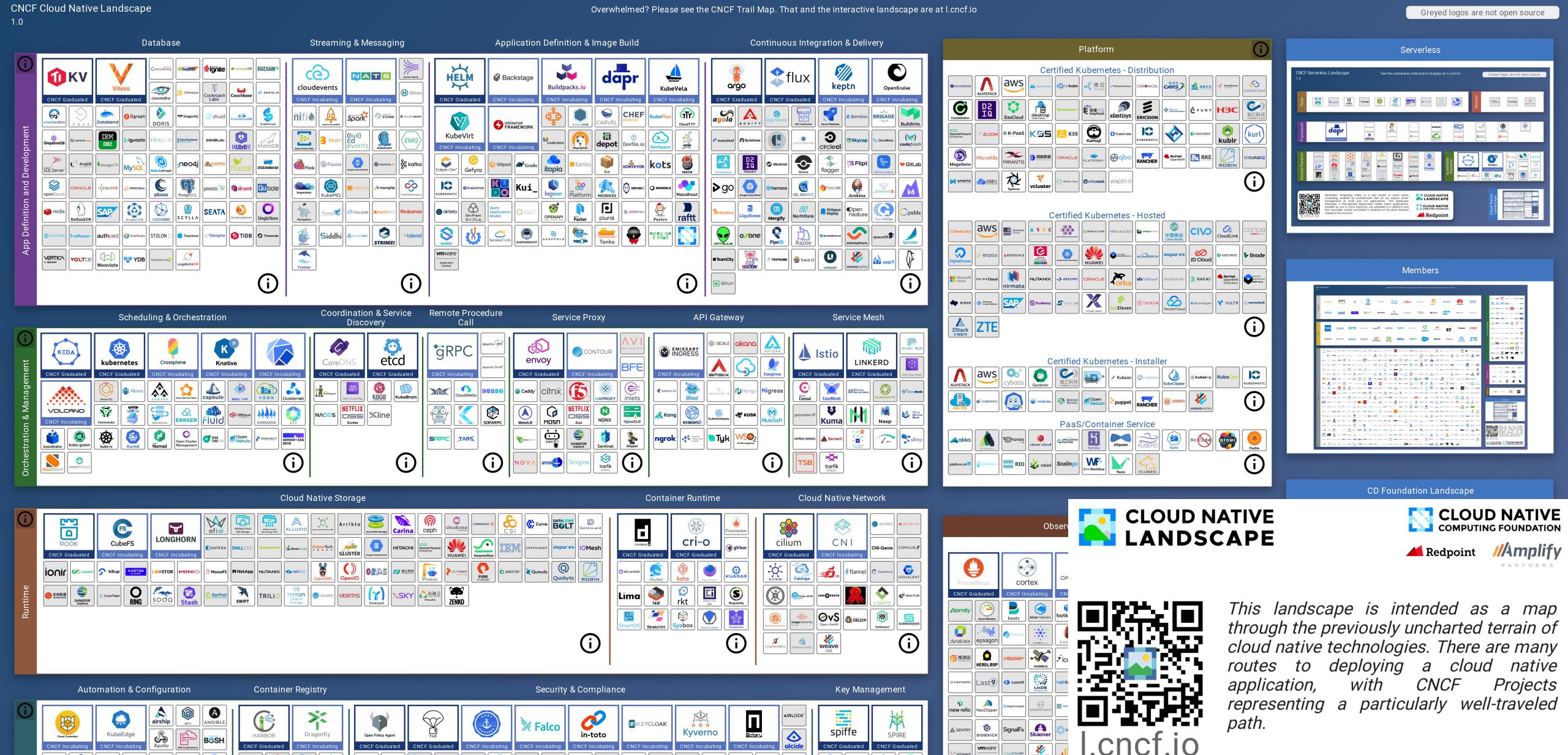


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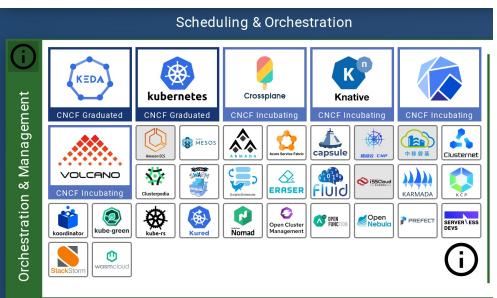
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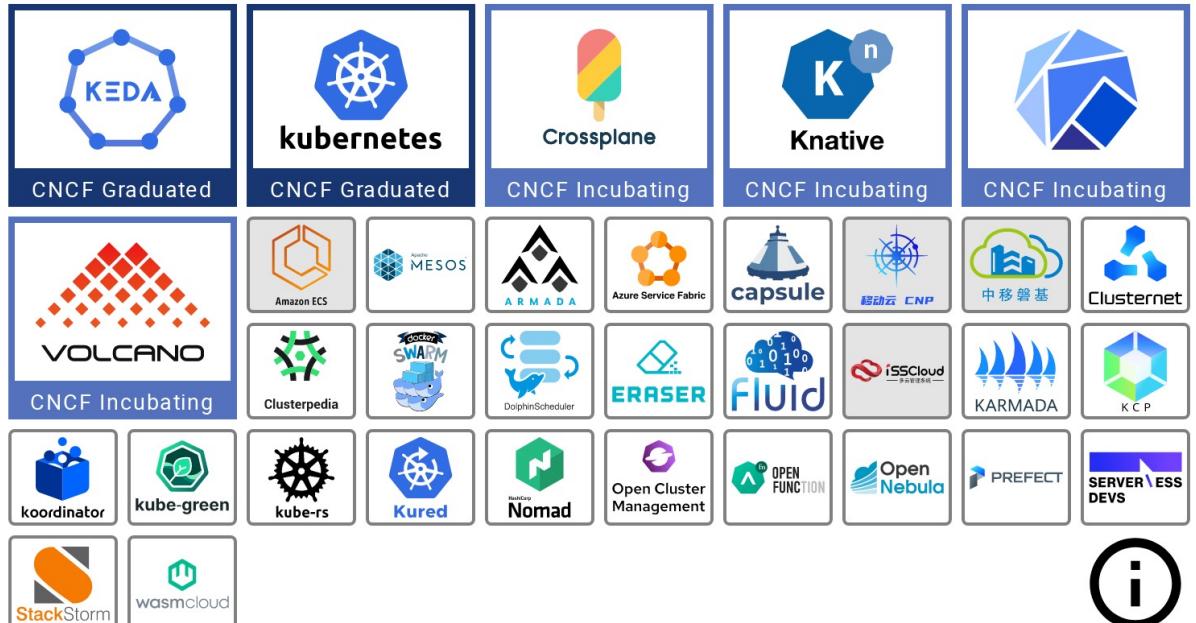
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Orchestration & Management

## Scheduling & Orchestration



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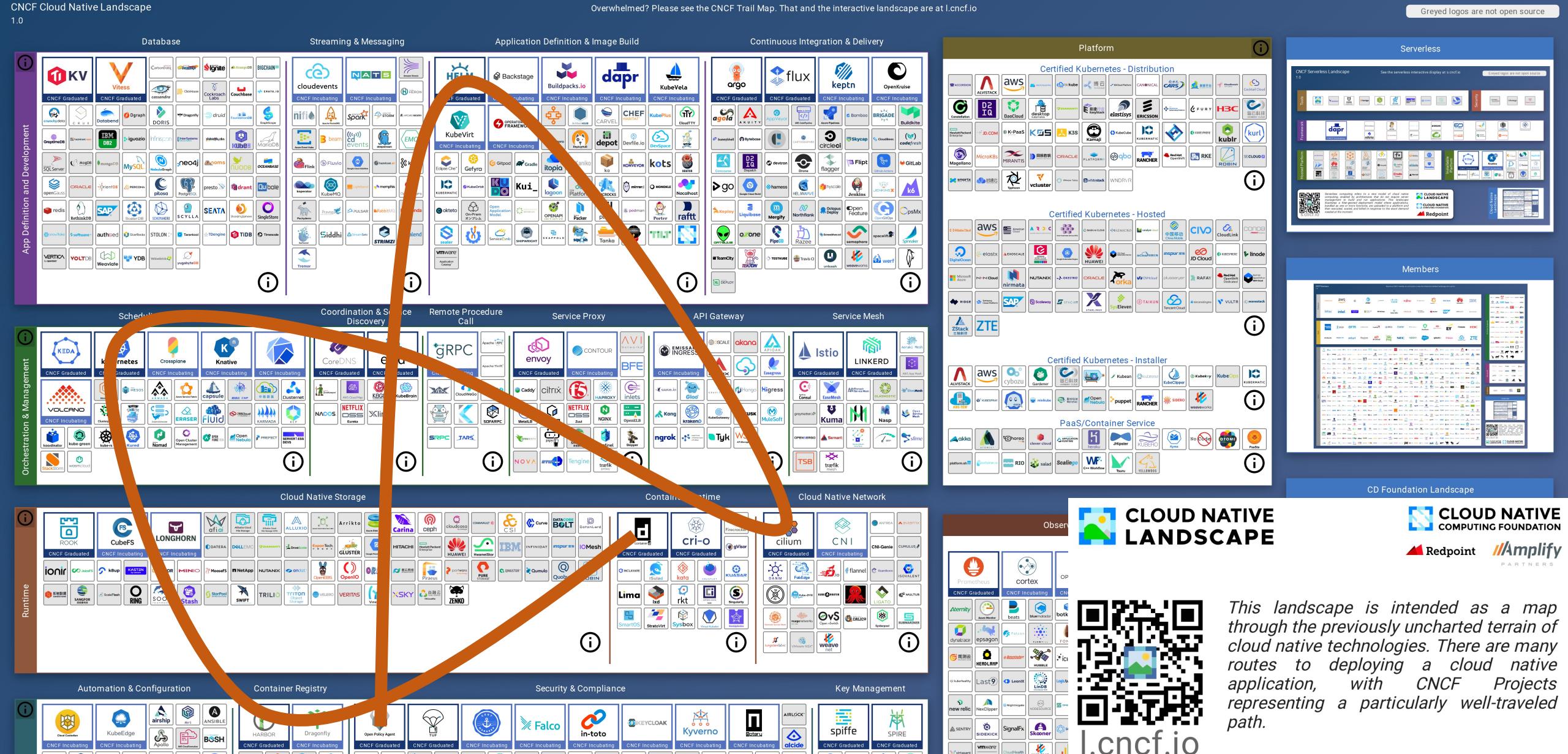
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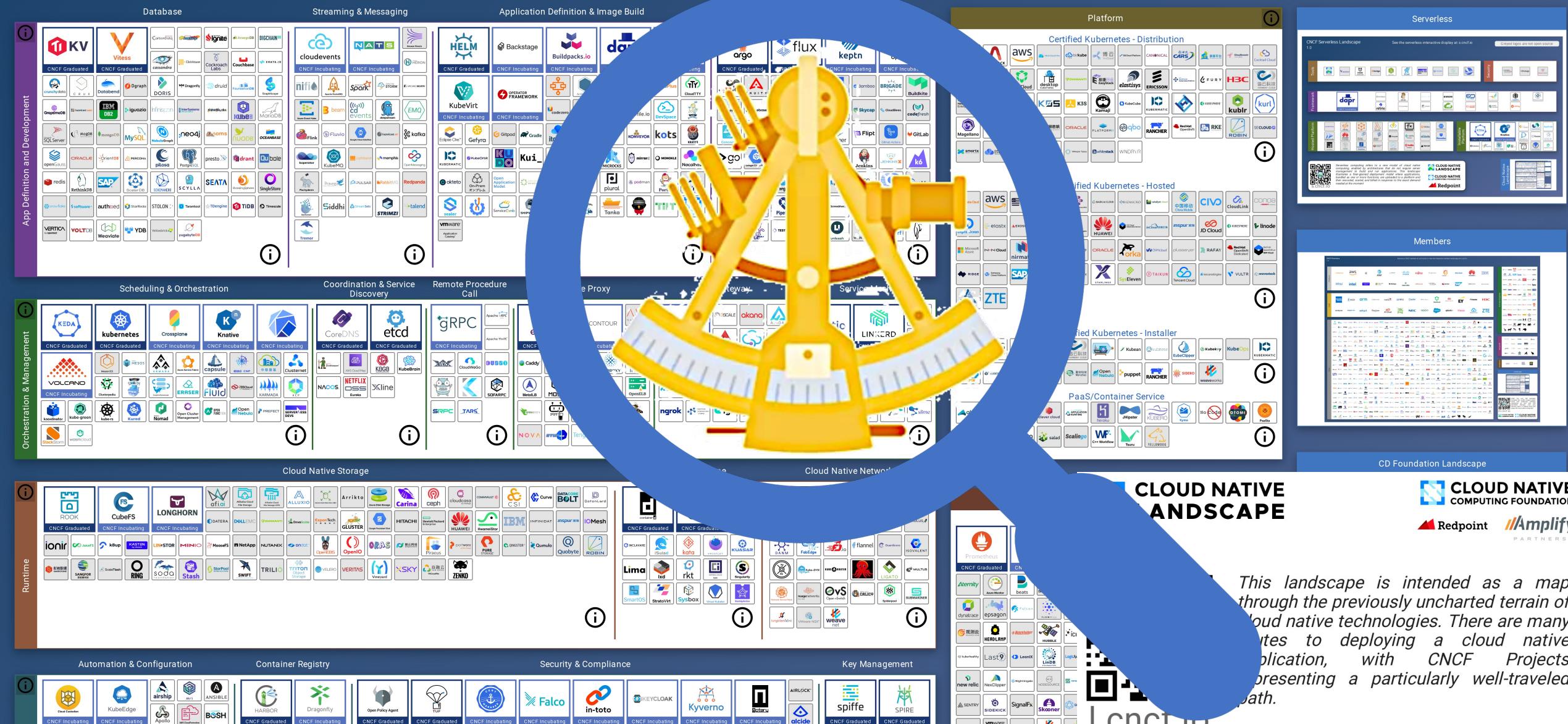
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Greyed logos are not open source

Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at [l.cncf.io](https://l.cncf.io)

CNCF Cloud Native Landscape

1.0



# CNCF Stages

# CNCF Stages



Landscape Guide

Reset Filters

Grouping

CNCF Relation

Sort By

Alphabetical (a to z)

Category

Any

Project

CNCF Projects

CNCF Graduated Projects

CNCF Incubating Projects

CNCF Sandbox Projects

Archived CNCF Projects

CNCF Member Products/Projects

Non-CNCF Member Products/Projects

Any

Industry

Any

Download as CSV

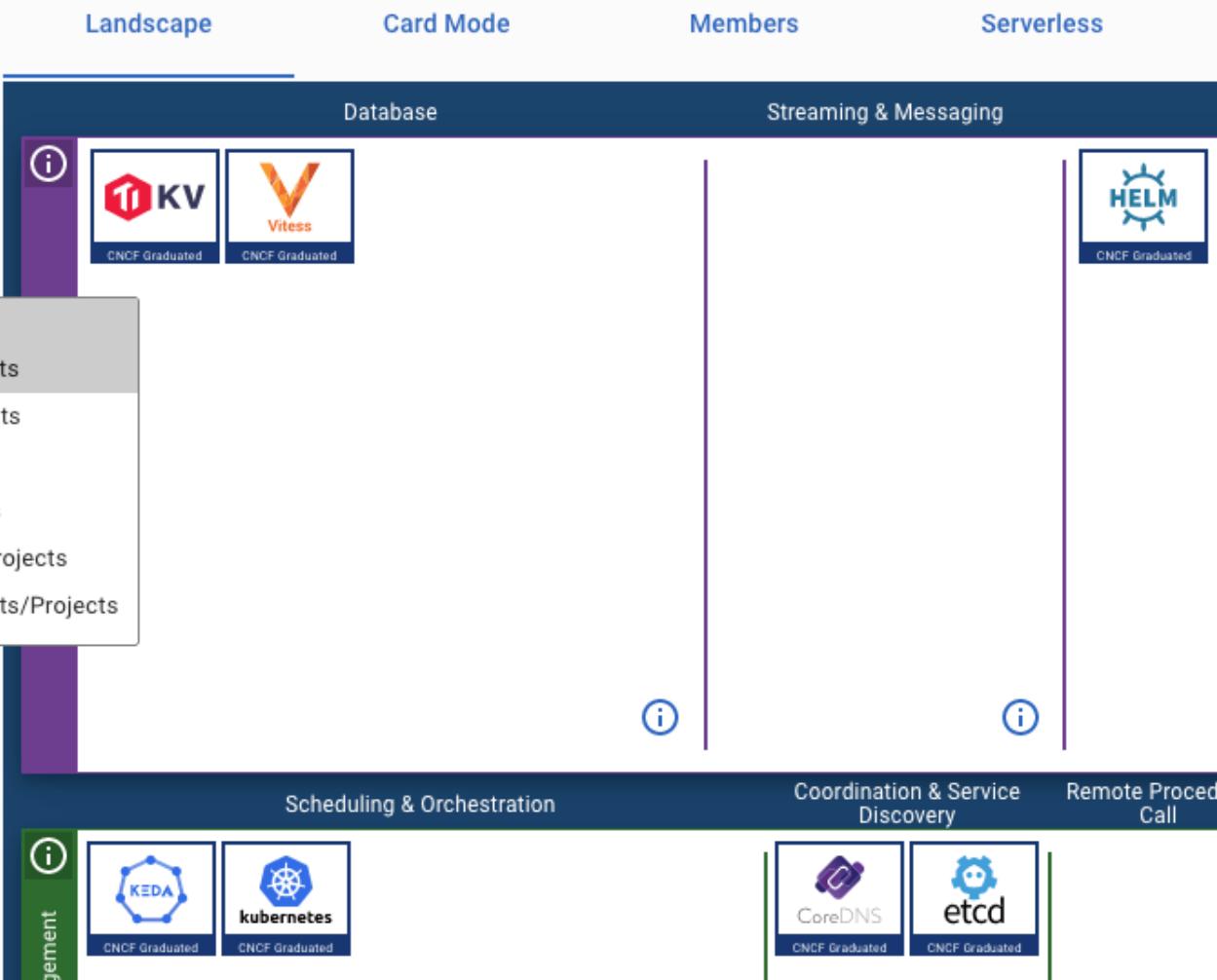
Example filters

Cards by age

## CNCF Cloud Native Interactive Landscape

The cloud native landscape ([png](#), [pdf](#)), serverless landscape ([png](#), [pdf](#)), and member landscape ([png](#), [pdf](#)) are dynamically generated.

You are viewing 24 cards with a total of 467,559 stars and funding of \$3M.



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# CNCF Graduated Projects



# Cloud Native Trail Map

<https://github.com/cncf/trailmap>



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## 1. CONTAINERIZATION

- Commonly done with Docker containers
- Any size application and dependencies (even PDP-11 code running on an emulator) can be containerized
- Over time, you should aspire towards splitting suitable applications and writing future functionality as microservices



## 3. ORCHESTRATION & APPLICATION DEFINITION

- Kubernetes is the market-leading orchestration solution
- You should select a Certified Kubernetes Distribution, Hosted Platform, or Installer: [cncf.io/ck](http://cncf.io/ck)
- Helm Charts help you define, install, and upgrade even the most complex Kubernetes application



## 2. CI/CD

- Setup Continuous Integration/Continuous Delivery (CI/CD) so that changes to your source code automatically result in a new container being built, tested, and deployed to staging and eventually, perhaps, to production
- Setup automated rollouts, roll backs and testing
- Argo is a set of Kubernetes-native tools for deploying and running jobs, applications, workflows, and events using GitOps paradigms such as continuous and progressive delivery and MLOps



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## 4. OBSERVABILITY & ANALYSIS

- Pick solutions for monitoring, logging and tracing
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# Containerization

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# Open Container Initiative



OPEN CONTAINER INITIATIVE



Container Runtime Spec



Container Image Spec



Container Image Distribution Spec



Docker donated its container format, runtime, and runC, to the OCI

# Containerization

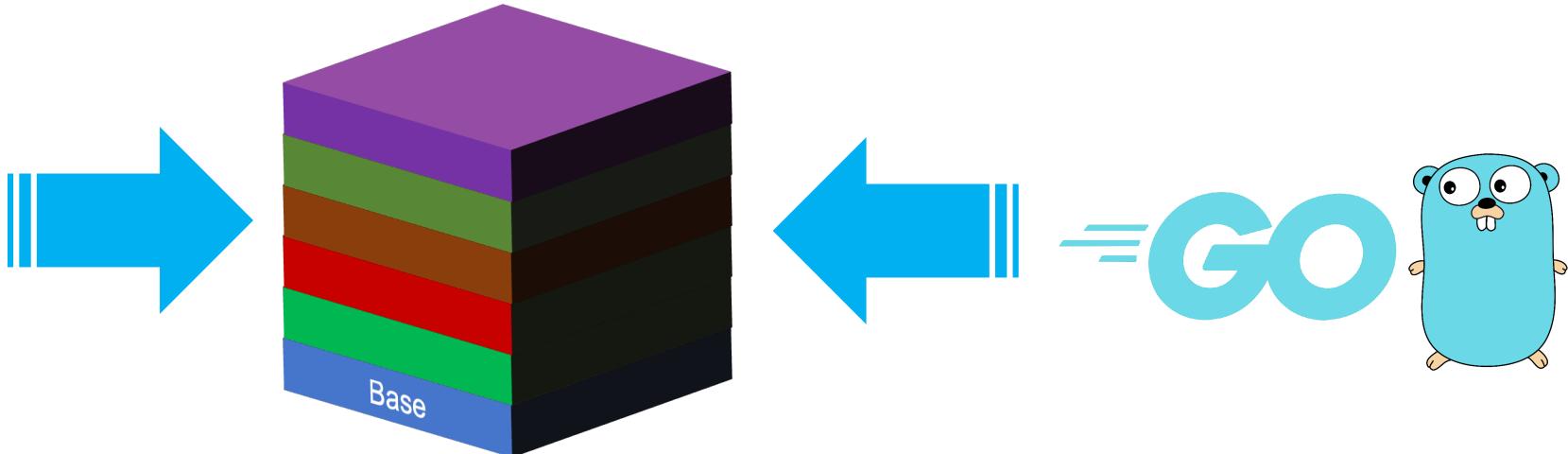
It works on  
my  
machine!



# Containerization



```
1 package main
2
3 import (
4     "fmt"
5     "net/http"
6 )
7
8 func hello(w http.ResponseWriter, req *http.Request) {
9     fmt.Fprintf(w, "Hello, world!\n")
10 }
11
12 func headers(w http.ResponseWriter, req *http.Request) {
13     for name, headers := range req.Header {
14         for _, h := range headers {
15             fmt.Fprintf(w, "%v: %v\n", name, h)
16         }
17     }
18 }
19
20 func main() {
21     http.HandleFunc("/hello", hello)
22     http.HandleFunc("/headers", headers)
23     http.ListenAndServe(":80", nil)
24 }
```



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# Cloud Native Trail Map

## 7. DISTRIBUTED DATABASE & STORAGE

When you need more resiliency and scalability than you can get from a single database, Vitess is a good option for running MySQL at scale through sharding. Rook is a storage orchestrator that integrates a diverse set of storage solutions into Kubernetes. Serving as the "brain" of Kubernetes, etcd provides a reliable way to store data across a cluster of machines. TiKV is a high performant distributed transactional key-value store written in Rust.



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## 9. CONTAINER REGISTRY & RUNTIME

Harbor is a registry that stores, signs, and scans content. You can use alternative container runtimes. The most common, both of which are OCI-compliant, are containerd and CRI-O.



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## 8. STREAMING & MESSAGING

When you need higher performance than JSON-REST, consider using gRPC or NATS. gRPC is a universal RPC framework. NATS is a multi-modal messaging system that includes request/reply, pub/sub and load balanced queues. CloudEvents is a specification for describing event data in common ways.



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## 10. SOFTWARE DISTRIBUTION

If you need to do secure software distribution, evaluate Notary, an implementation of The Update Framework.



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 HARBOR  
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 cri-o  
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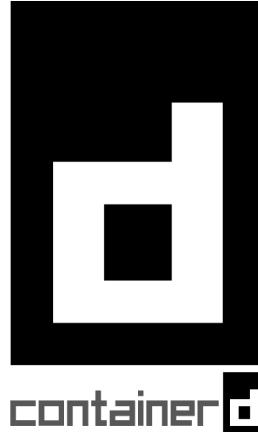
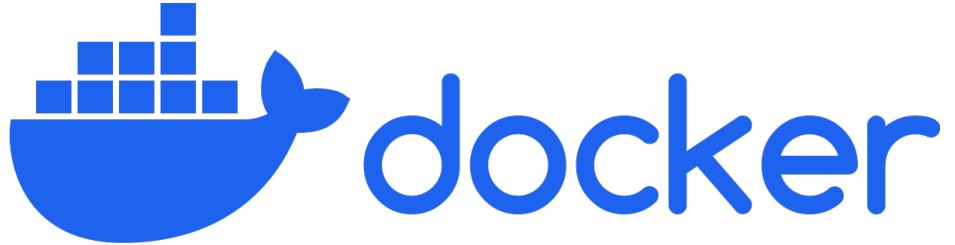
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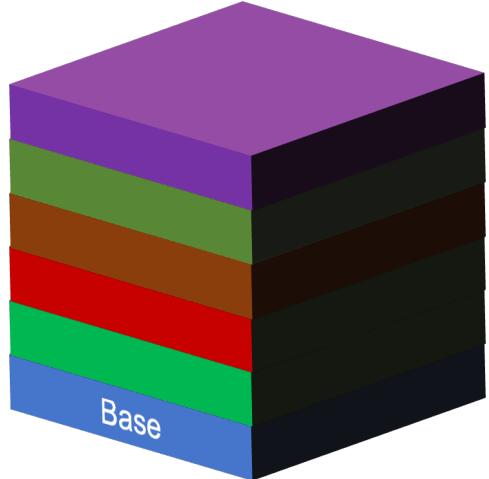
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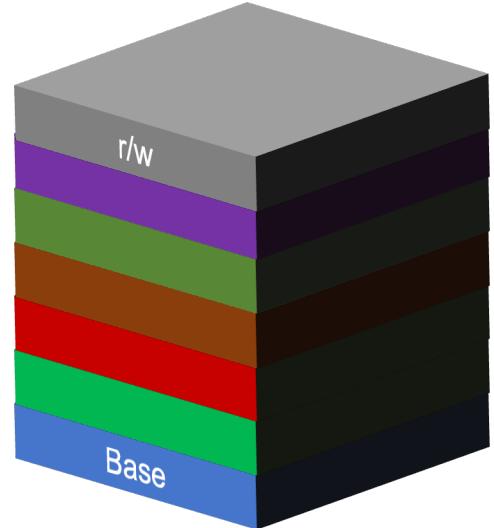
# Container Runtime



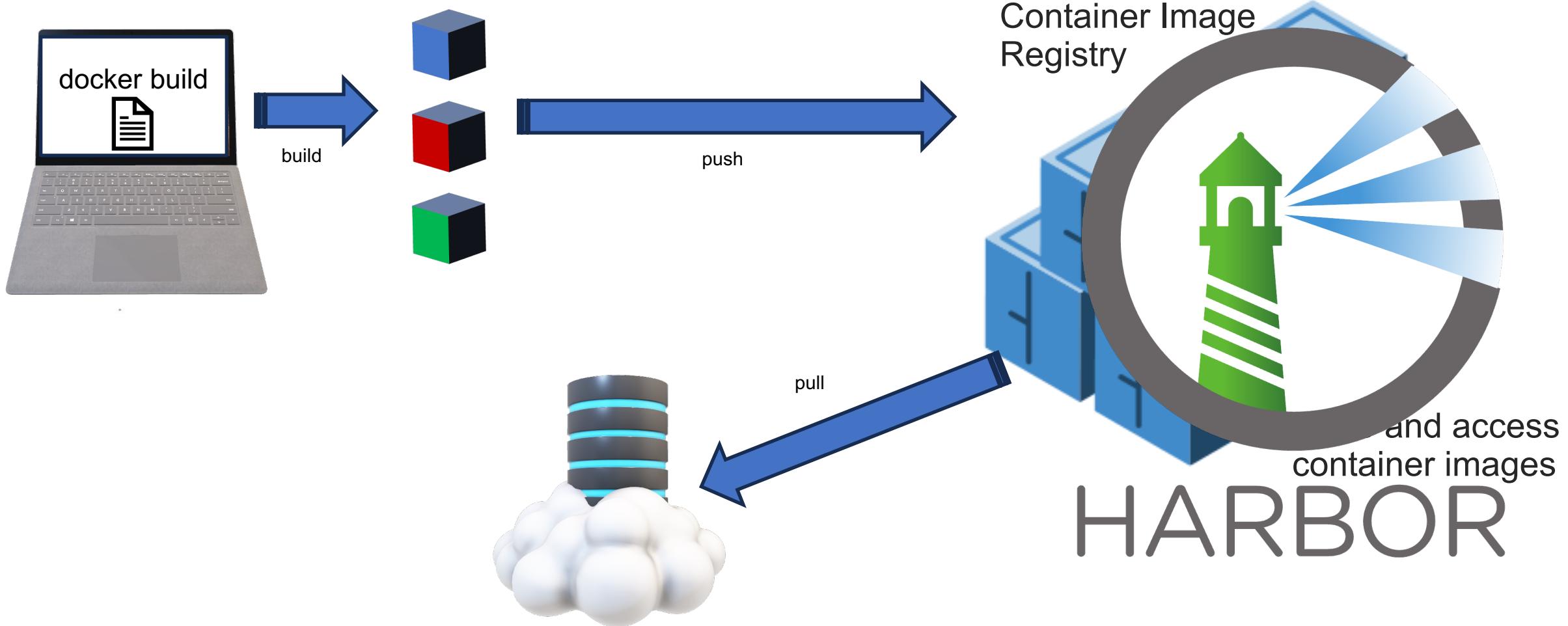
runc



Container runtime runs executes containers  
based on container images



# Container Registry



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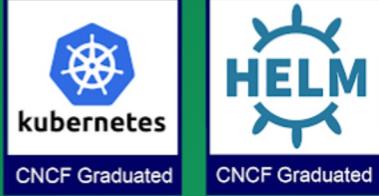
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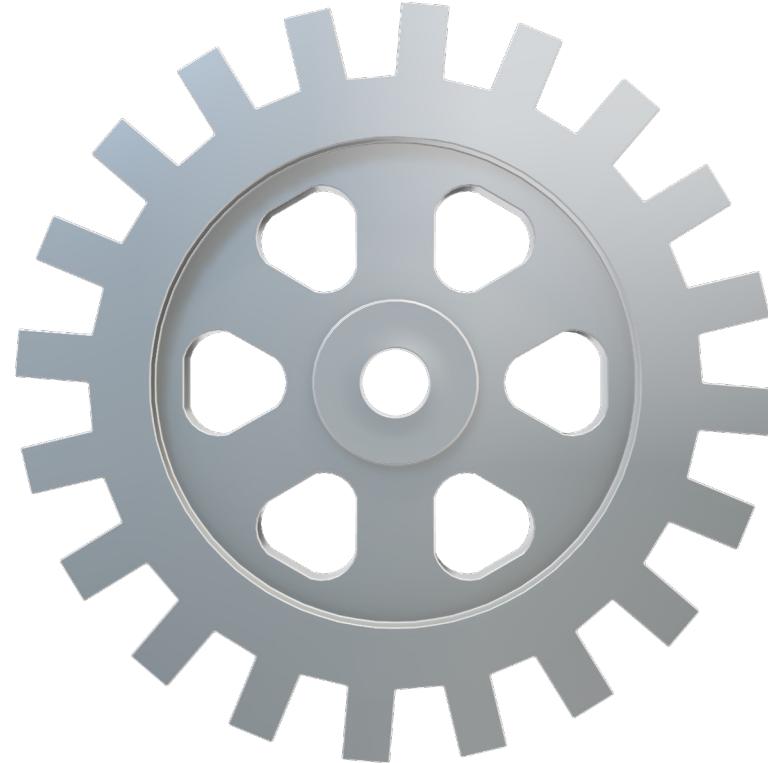
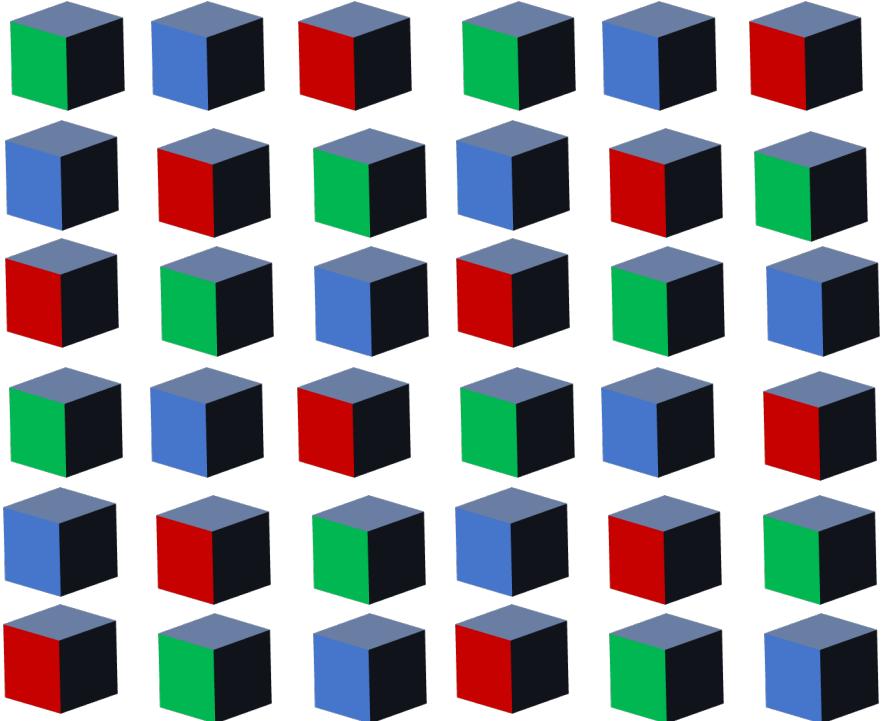
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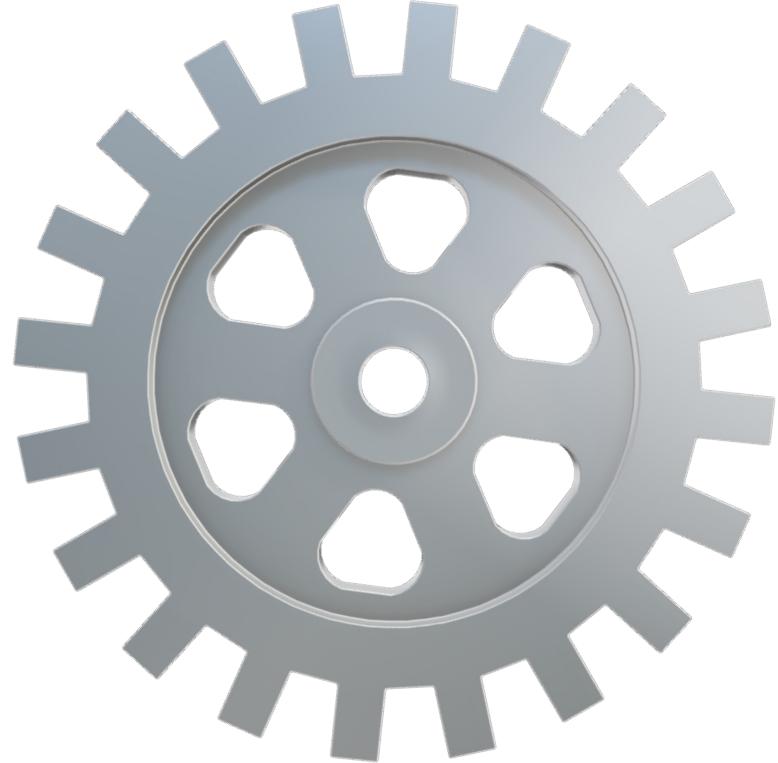
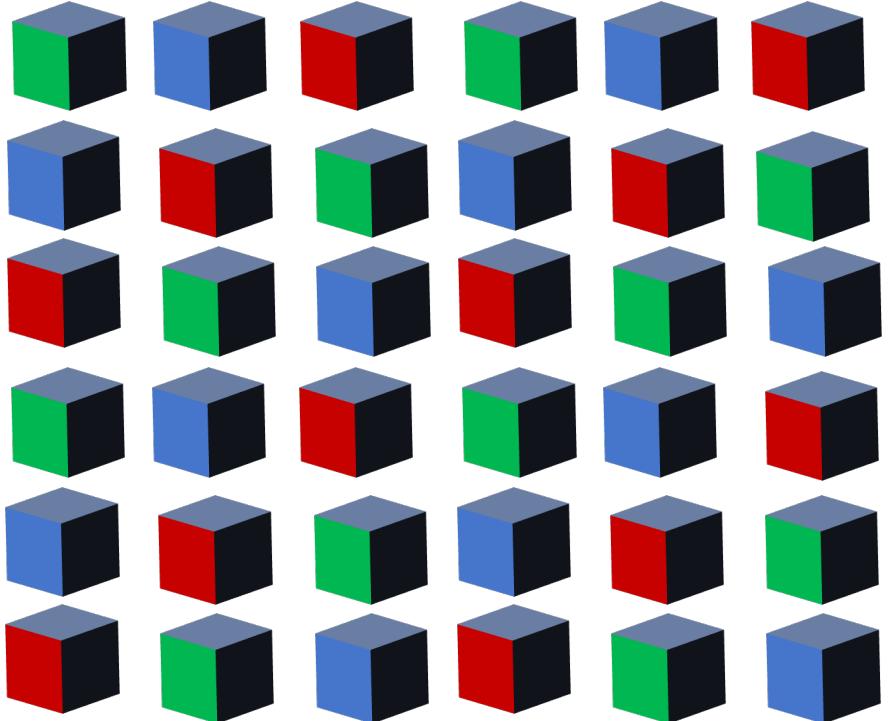
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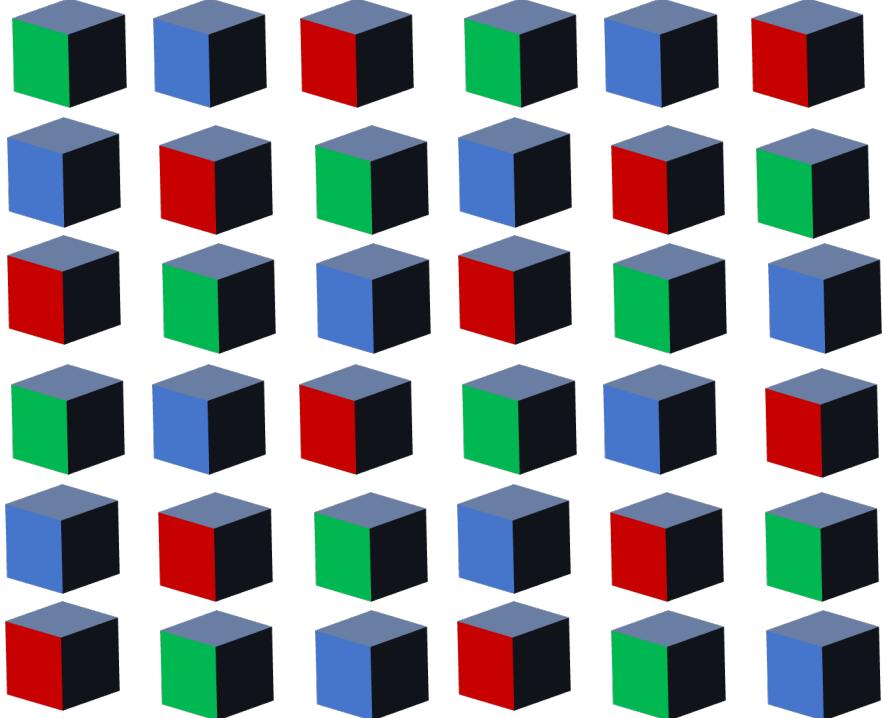
# Container Orchestration



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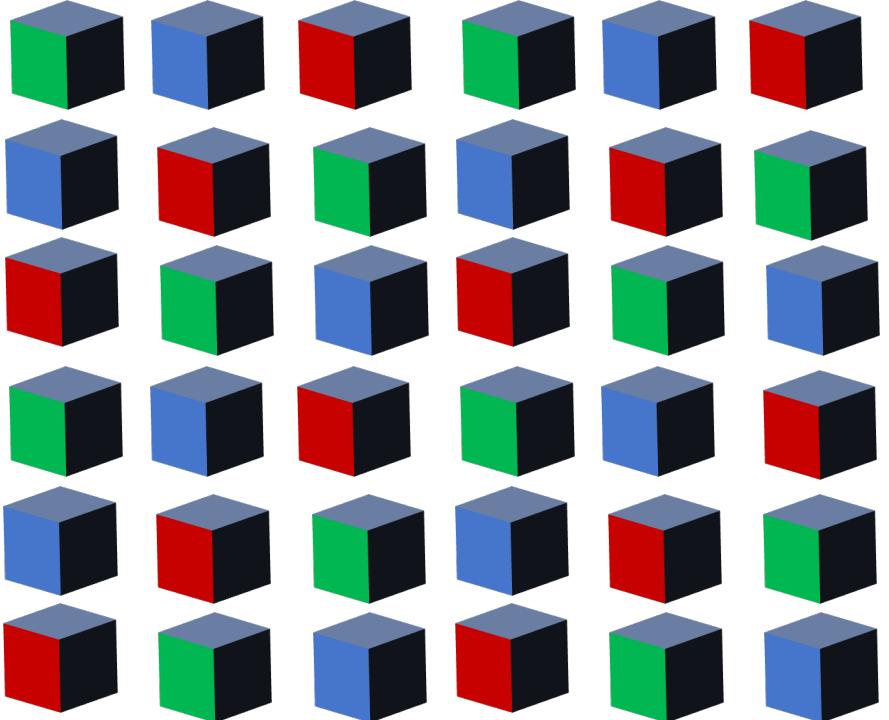


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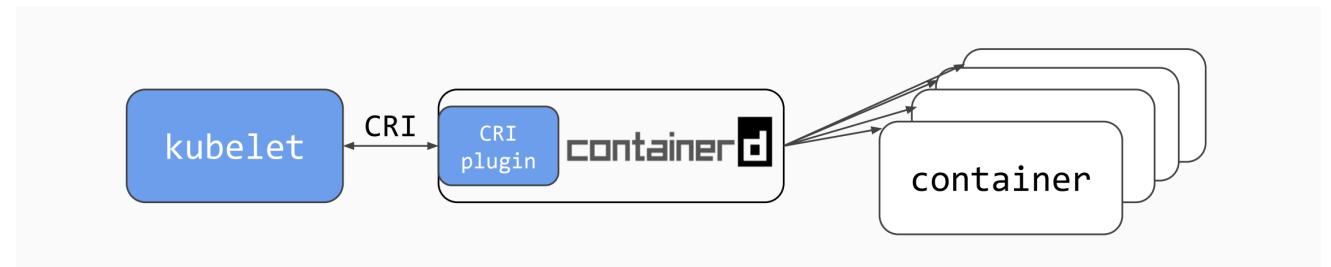


- Deploy and Manage Containerized Applications on Distributed Compute At-Scale
- Container Scheduling
- Container Networking
- Declarative Configuration
- Self Healing
- Service Discovery & Load Balancing
- Horizontal Scaling
- Automated Rollouts and Rollbacks
- Storage Orchestration
- Configuration Management

# Container Orchestration



# kubernetes



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argo

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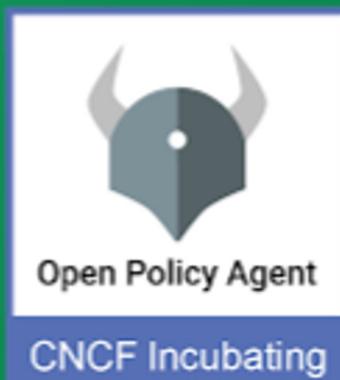
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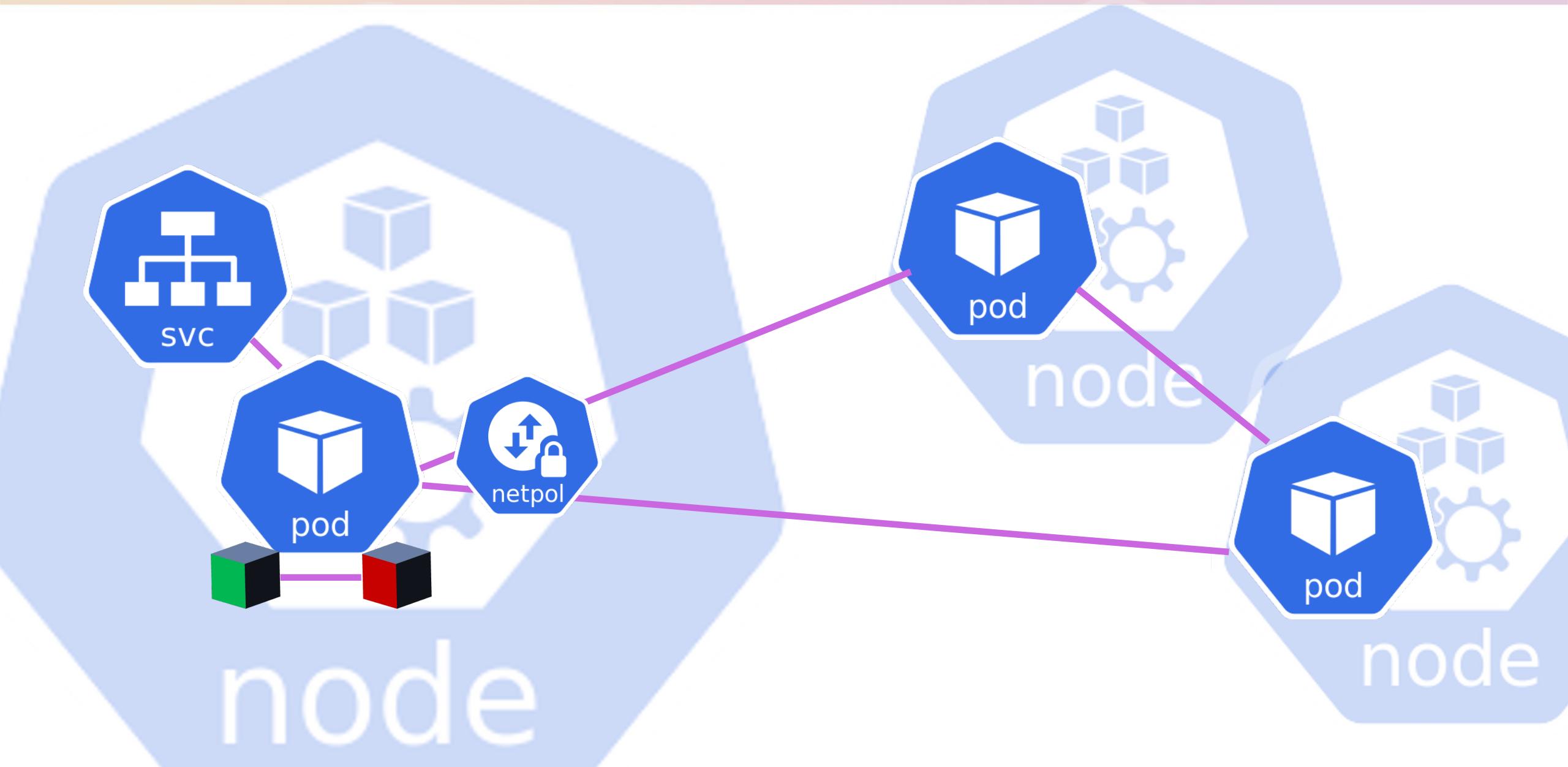


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# Networking



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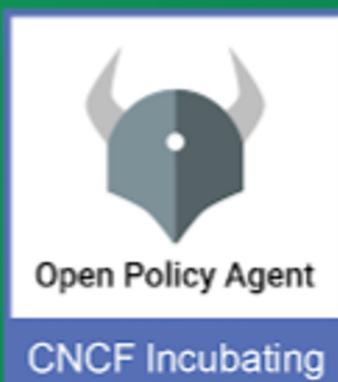


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kubernetes  
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envoy  
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CoreDNS  
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fluentd  
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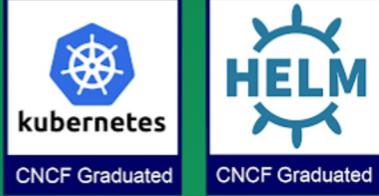
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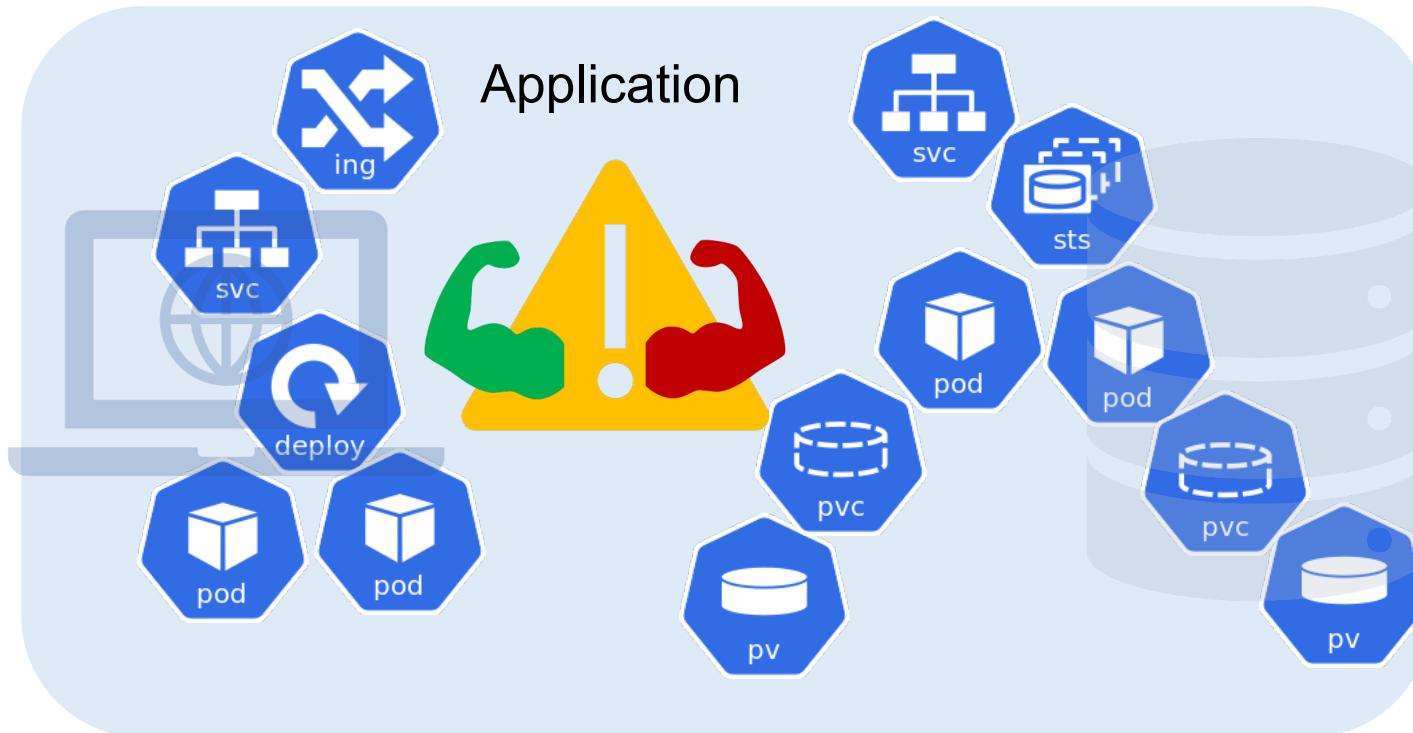
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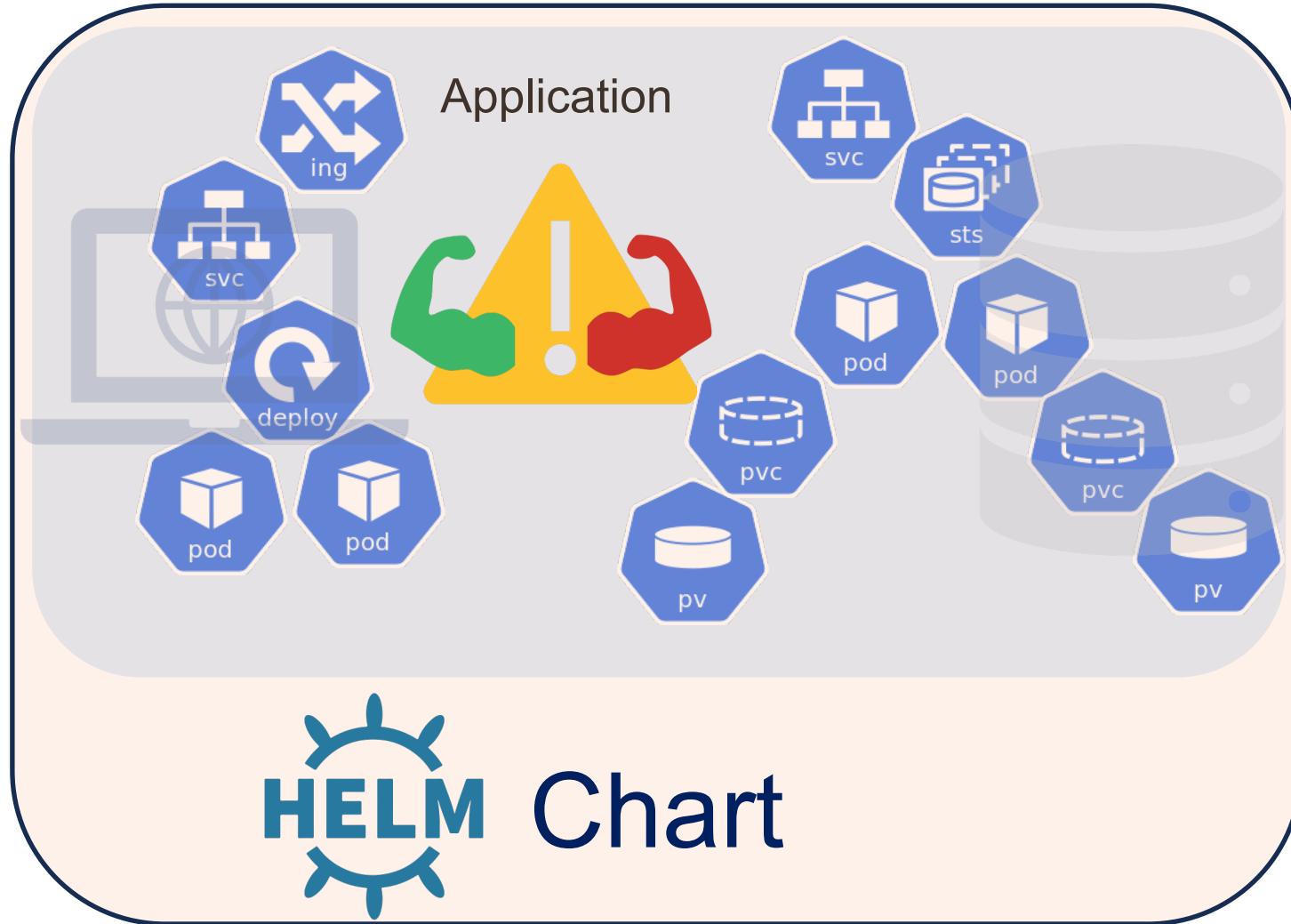
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# Application Definition



# Application Definition



# Cloud Native Trail Map

<https://github.com/cncf/trailmap>

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## 5. SERVICE PROXY, DISCOVERY, & MESH

- CoreDNS is a fast and flexible tool that is useful for service discovery
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## 4. OBSERVABILITY & ANALYSIS

- Pick solutions for monitoring, logging and tracing
- Consider CNCF projects Prometheus for monitoring, Fluentd for logging and Jaeger for Tracing
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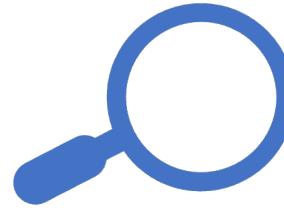
# Observability and Analysis



observability



# Observability and Analysis



observability



Metrics



Logs



Traces

# Observability and Analysis - Metrics



Monitoring toolkit that collects and stores metrics as time series data

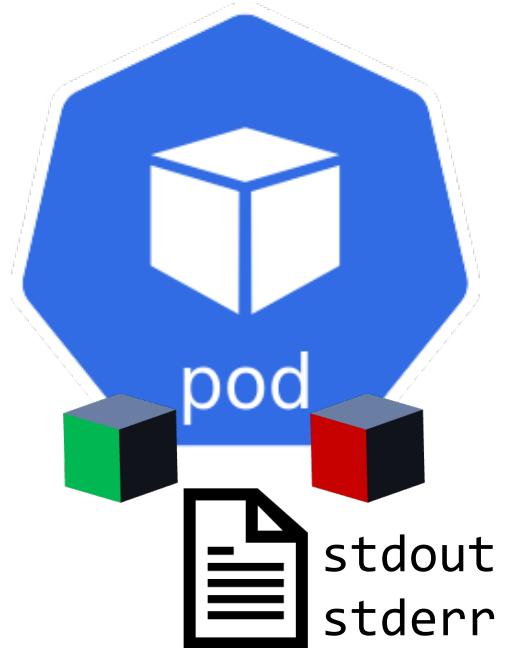
The screenshot shows the Prometheus web interface with the following details:

- Top Bar:** Prometheus, Alerts, Graph, Status, Help, and three icons.
- Query Settings:** Use local time (unchecked), Enable query history (unchecked), Enable autocomplete (checked), Enable highlighting (checked), and Enable linter (checked).
- Search Bar:** Contains the query `node_cpu_seconds_total{cpu="0"}[5m]` and an Execute button.
- Metrics Table:** Shows the results of the query. The first row is highlighted in yellow. Each row contains the metric name and its value for each dimension: `node_cpu_seconds_total{container="node-exporter", cpu="0", endpoint="http-metrics", instance="172.31.46.246:9100}`.



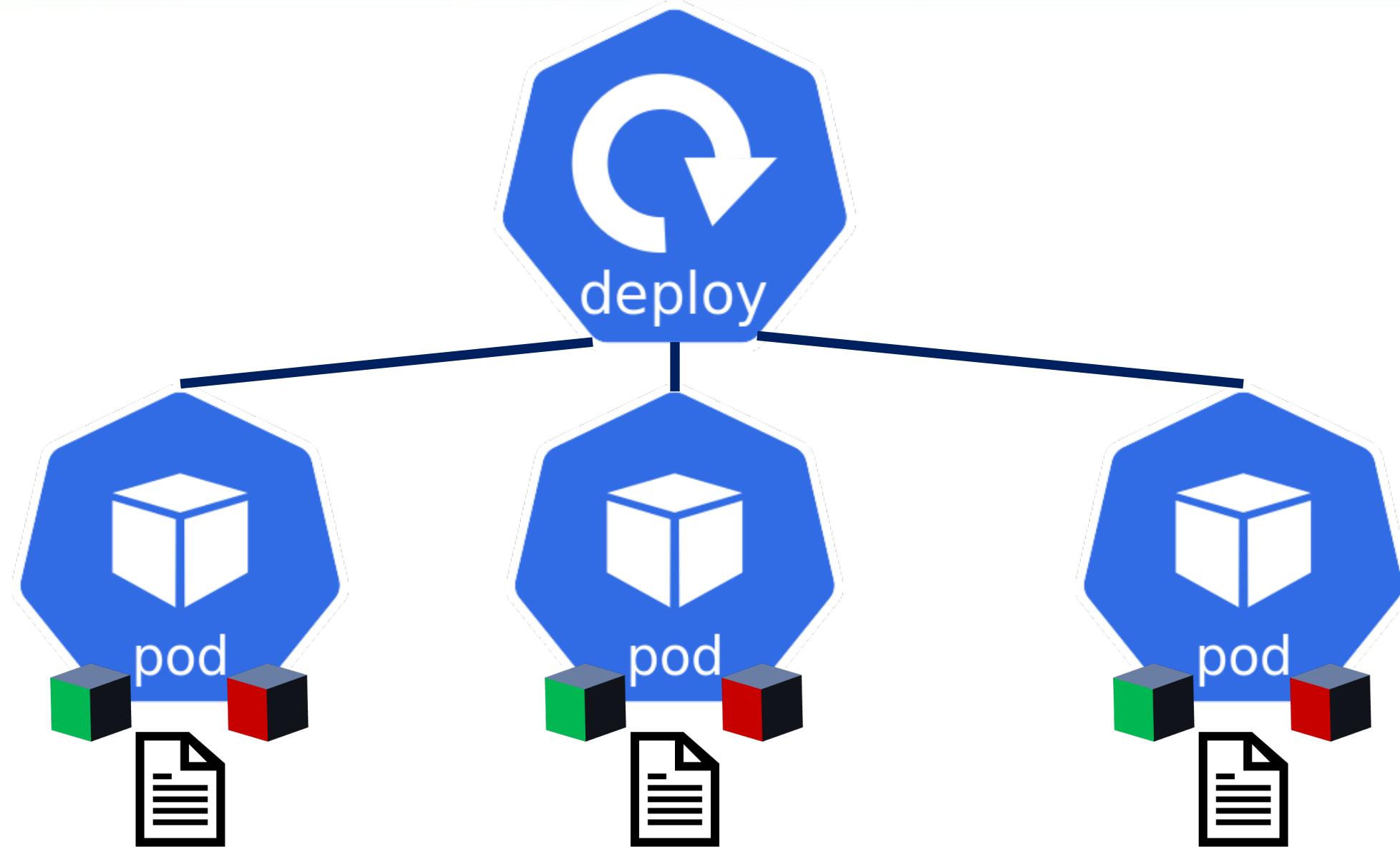
# Prometheus

# Observability and Analysis - Logs

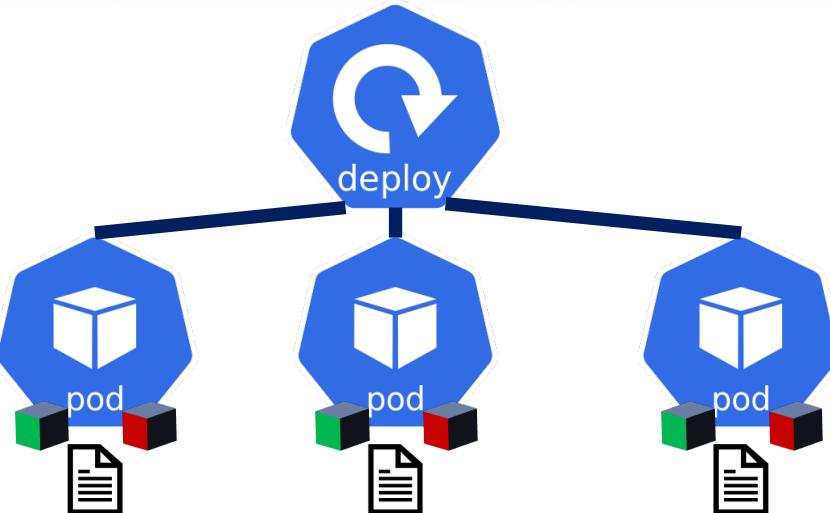


```
$ kubectl logs -n my-namespace nginx-789bf7b8fc-95b45
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to
perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-
default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of
/etc/nginx/conf.d/default.conf
```

# Observability and Analysis - Logs

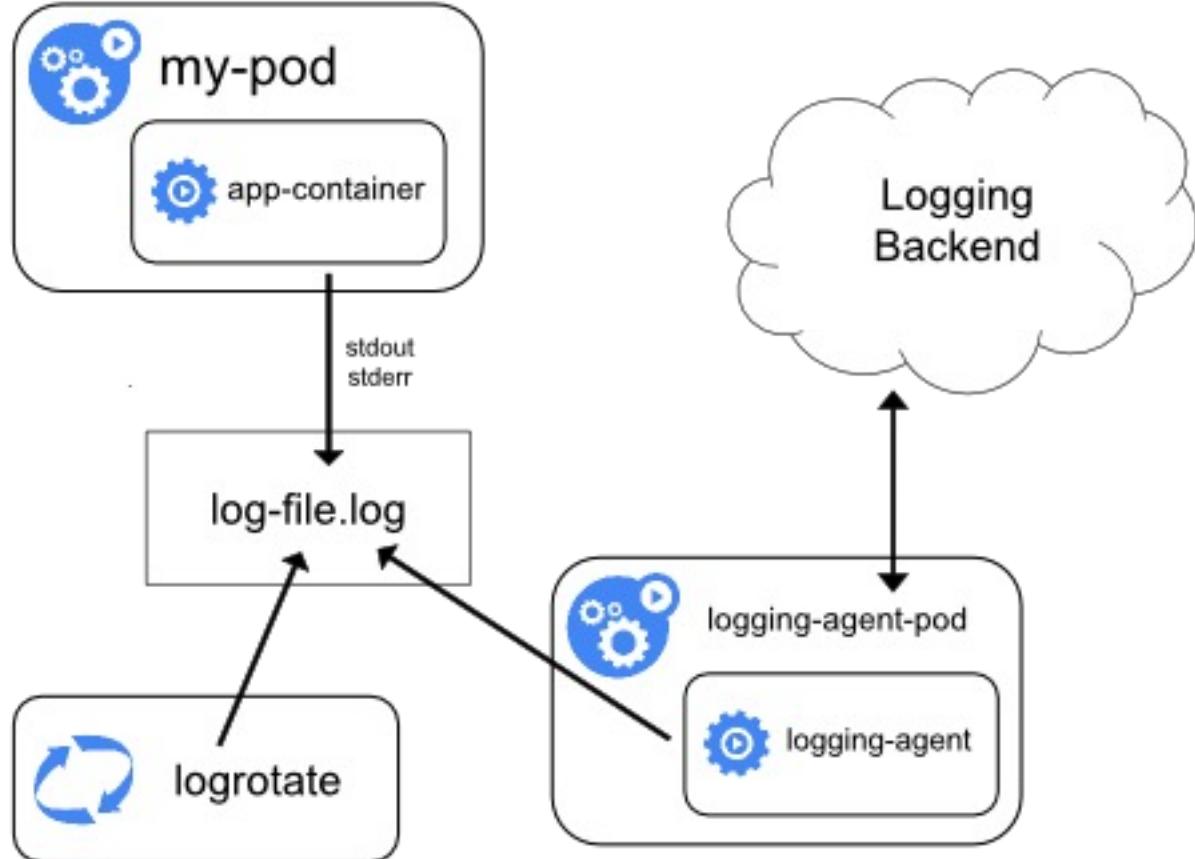


# Observability and Analysis - Logs



```
$ kubectl logs -n my-namespace -l app=nginx
2023/11/02 06:35:40 [error] 29#29: *1 open()
"/usr/share/nginx/html/favicon.ico" failed (2: No such file or directory),
client: 10.0.0.65, server: localhost, request: "GET /favicon.ico HTTP/1.1",
host: "kubernetes.34.222.160.192.sslip.io:30000", referrer:
"http://kubernetes.34.222.160.192.sslip.io:30000/"
10.0.0.65 - - [02/Nov/2023:15:52:32 +0000]
"\x16\x03\x01\x00\x85\x01\x00\x00\x81\x03\x03+Y\xFD\x07Q\x1E\xDC\x9D~\x04q7
\xF73\xFB\xED\xBAN\xEB\xED\xFF\x04\xC8i]\xF2@\xBB\xA2\x14\xA09\x00\x00
\xC0/\xC00\xC0+\xC0,\xCC\xA8\xCC\xA9\xC0\x13\xC0\x09\xC0\x14\xC0" 400 157
"- - - - -"
```

# Observability and Analysis - Logs



# fluentd

Unified data / log collector

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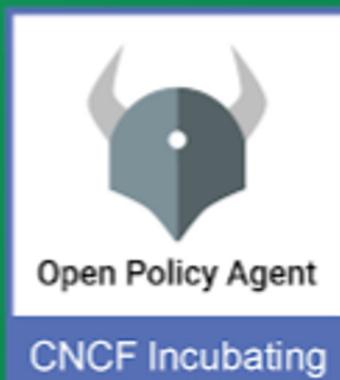
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# Policy

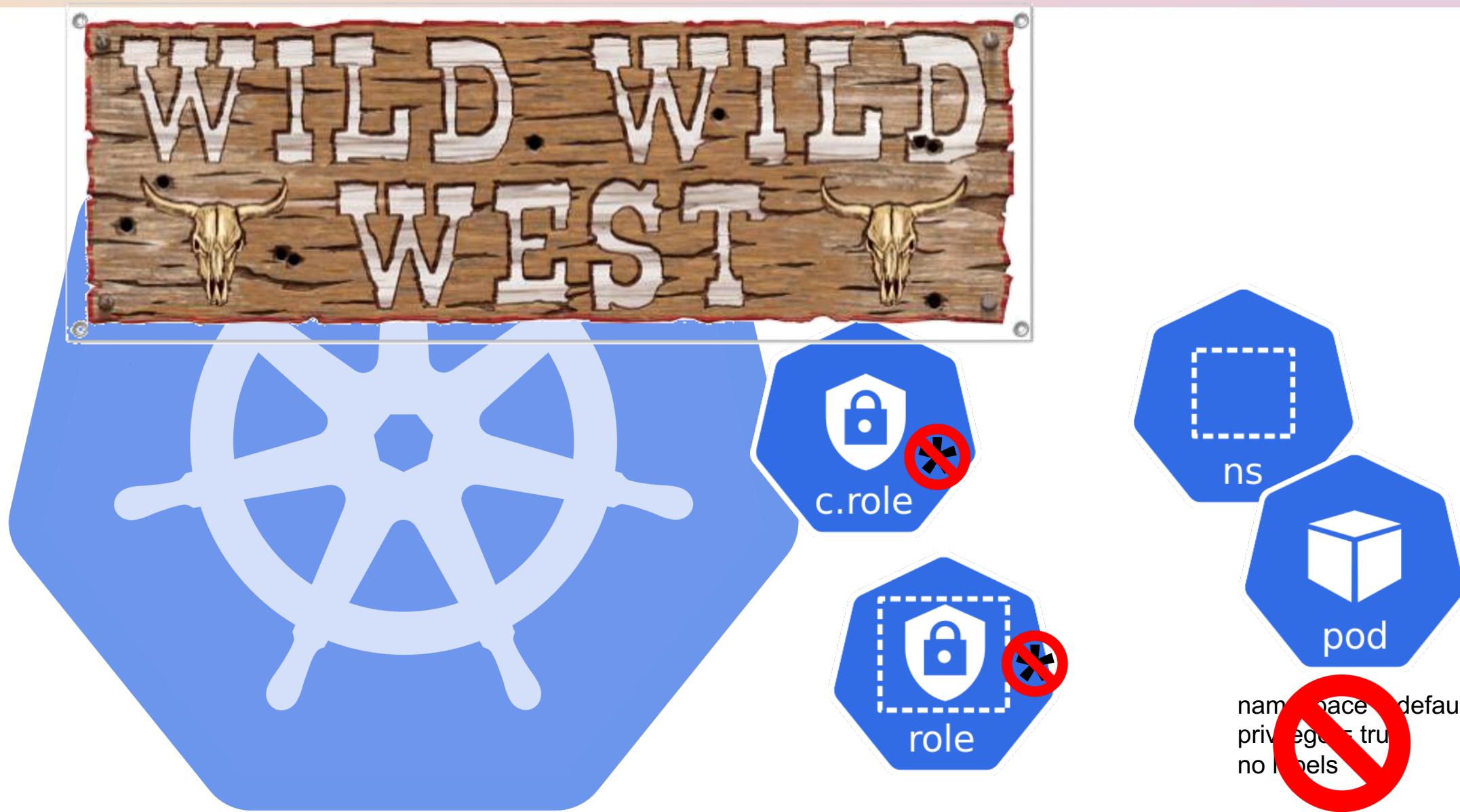


KubeCon

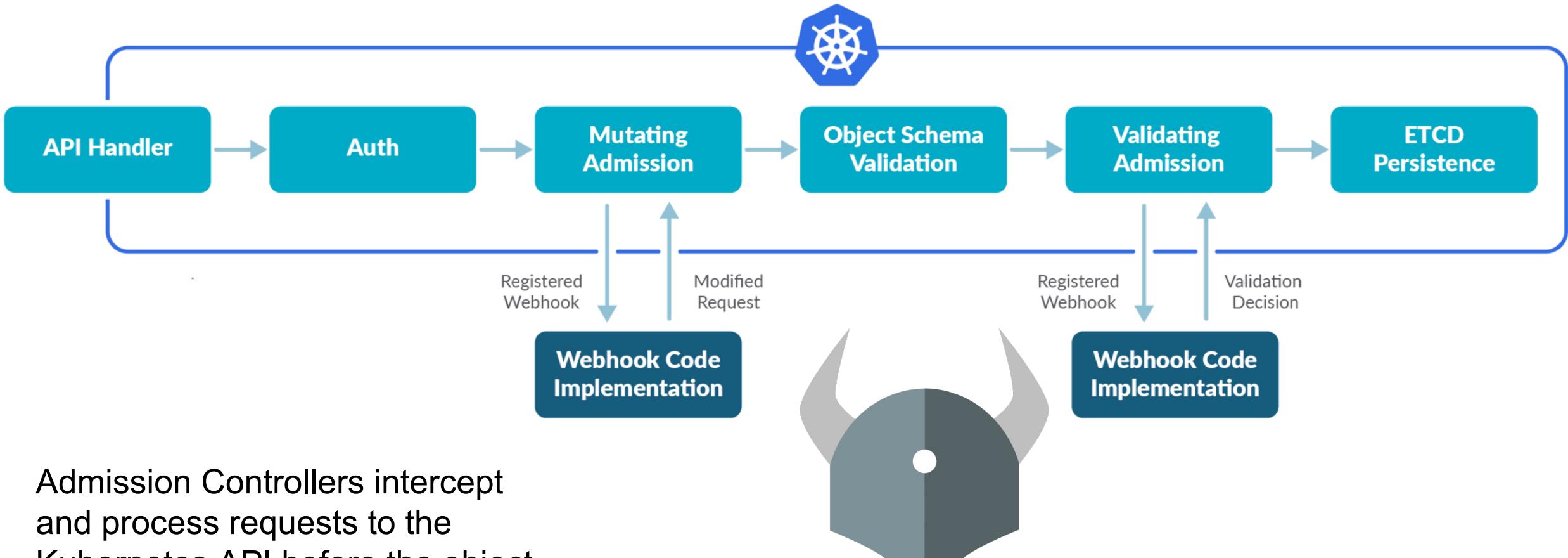


CloudNativeCon

North America 2023



# Policy – Admission Control



Admission Controllers intercept and process requests to the Kubernetes API before the object is created. They can validate or mutate.

Open Policy Agent

Policy engine that unifies policy enforcement

# Hands-On with Hobbyfarm

 Cloud Native Essentials

Select a scenario

Cloud Native Essentials

KubeCon + CloudNativeCon 2023 NA:  
Cloud Native Essentials - A 101 Tutorial to  
Start Your Cloud Native Journey

 START SCENARIO  PRINT

Navigate to <https://lab.cloudnativeessentials.com>

Register with your email and password

Access Code: [kubecon23](#)

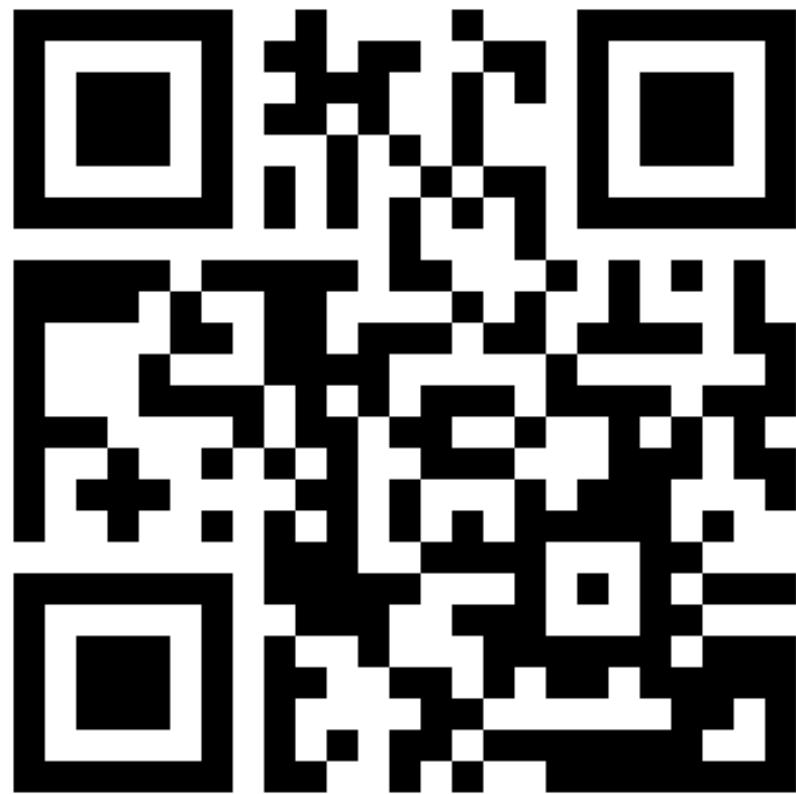
A browser refresh may be required

If no scenario shows, check the access code

Slides and Lab are available <https://github.com/cloudnativeessentials/kubecon2023>



PromCon  
North America 2021



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to leave feedback on this session**